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LARVAL FOODPLANT RECORDS FOR NORTH AMERICAN RHOPALOCERA

PART 2

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THIS IS THE SECOND IN A SERIES of papers on butterfly larval foodplants. In our first paper (1969), we reviewed the extensive literature on foodplants, described sources of error in reporting foodplants, and presented a method of reporting foodplants which would leave possible determination errors open to correction through deposition of both plant and butterfly material for the use of future workers. Two additional papers have recently come to our attention (Hovanitz, 1969; Hovanitz & Chang, 1965). Herein we report 51 foodplant records for 35 species or subspecies of North American butterflies.

Most of the plant determinations were made by one of us (D.E.B.) who was assisted on some identifications by John Thomas Howell, California Academy of Sciences. We wish to thank James L. Reveal, Department of Botany, University of Maryland, for identifying the *Eriogonum* species. This work was supported largely by grants from the Allyn Foundation, Sarasota, Florida.

FOODPLANT RECORDS

(The format has been changed slightly from the first paper.) Each plant species name is followed by the collector's plant specimen number (for either J. F. Emmel or O. Shields); this in turn is followed by the abbreviation for the herbarium of

deposition for that plant specimen (CAS = California Academy of Sciences, San Francisco, California; DS = Dudley Herbarium, Stanford University, Stanford, California; NA = United States National Arboretum, Washington, D.C.). The plant family is also given in parantheses following the herbarium abbreviation. All butterfly material was collected by J.F.E. and O.S. unless otherwise specified and is deposited at the Los Angeles County Museum of Natural History, Los Angeles, California.

PAPILIONIDAE

1. *Papilio rutulus* Lucas. Nevada: Lander Co.; 4 to 5 road miles E. of Carroll Summit, 6600', along highway near stream, June 14, 1969; female oviposited at 2:20 p.m. PST on leaf of *Salix exigua* Nutt., J. F. Emmel 164 (CAS); (Salicaceae).
2. *Parnassius phoebus behrii* Edwards. (A) California: Mono Co.; north slope of Mt. Dana at lower end of Glacier Canyon, 10,800-11,200', on benches on steep rocky slope, August 8, 1969; female oviposited at 9:30 a.m. PST on soil near *Sedum rosea* (L.) Scop. ssp. *integrifolium* (Raf.) Hult., J. F. Emmel 213 (CAS); (Crassulaceae).
(B) California: Tuolumne Co.; NW above Upper Gaylor Lake, 11,000', NW of Tioga Pass, on open gravelly slope, August 9, 1969; female oviposited at 10:40 a.m. PST on shrub 6 inches from *Sedum lanceolatum* Torr., J. F. Emmel 217 (CAS); (Crassulaceae).
3. *Parnassius phoebus rubina* Wyatt. (A) Nevada: Elko Co.; slope $\frac{1}{2}$ air mile S. of Bonanza Gulch, 8200', Jarbidge Mts., on gravelly slope, July 22, 1969; female oviposited at 2:30 p.m. PST on soil near *Sedum lanceolatum* Torr., J. F. Emmel 193 (CAS); (Crassulaceae).
(B) Same locality as 3A above; July 23, 1969; female oviposited at 11:20 a.m. PST on a grass near *Sedum lanceolatum* Torr., specimen identical to J. F. Emmel 193.
(C) Nevada: Elko Co.; hill $\frac{2}{3}$ air mile E. of Angel Lake, 8200', East Humboldt Range, on gravelly slope, July 27, 1969; at 1:10 p.m. PST, female walked over and attempted oviposition on *Sedum lanceolatum* Torr., J. F. Emmel 198 (CAS); (Crassulaceae).

PIERIDAE

1. *Pieris beckerii* Edwards. (A) Nevada: Lander Co.; Kingston Canyon, 6600', Toiyabe Range, along road in canyon bottom, June 13, 1969; female oviposited at 12:30 p.m. PST on leaf of *Sisymbrium loeseli* L., *J. F. Emmel 155* (CAS); (Cruciferae).

(B) Nevada: Lander Co.; 4 to 5 road mi. E. of Carroll Summit, 6600', along highway near stream, June 14, 1969; female oviposited at 2:25 p.m. PST on leaf underside of *Lepidium perfoliatum* L., *J. F. Emmel 165* (CAS); (Cruciferae).

(C) Nevada: White Pine Co.; along road between North Creek and Kalamazoo Creek, between North Creek and summit of range, Schell Creek Range, July 5, 1969; female oviposited at 1:45 p.m. PST on leaf of *Descurainia sophia* (L.) Webb., *J. F. Emmel 181* (CAS); (Cruciferae).

(D) Nevada: Nye Co.; Jett Canyon, 6300-6800', Toiyabe Range, along dirt road, July 10, 1969; female oviposited at 2:15 p.m. PST on leaf of *Sisymbrium loeseli* L., *J. F. Emmel 184* (CAS); (Cruciferae).

2. *Pieris sisymbrii* Boisduval. (A) California: Kern Co.; in desert wash bottom, 2500', small canyon 2.2 road miles SW of Jawbone Canyon turnoff on State Hwy. 14, March 23, 1968, leg. JFE only; female oviposited on leaf underside of *Caulanthus coulteri* Wats., *J. F. Emmel 50* (CAS); (Cruciferae).

(B) California: Napa Co.; hills N. of road above Pope Creek and Maxwell Creek, in steep, rocky gulch on S. slope of hill, April 7, 1968, leg. JFE only; female oviposited on leaf underside of *Streptanthus glandulosus* Hook., *J. F. Emmel 57* (CAS); (Cruciferae).

(C) California: Mariposa Co.; small ravine N. of road, ca. 0.4 road mile W. of Yosemite National Park boundary on Hwy. 140, near El Portal, 2050-2250', April 12, 1970, leg. JFE only; ovum on leaf underside of *Arabis glabra* (L.) Bernh., *J. F. Emmel 258* (CAS); (Cruciferae). Ovum was reared to a mature larva which died and rotted; color pattern and morphology of this larva was compared with color photographs of *P. sisymbrii* larvae reared from ova laid by confined females, and found to be indistinguishable.

3. *Pieris protodice* Boisduval & Le Conte. (A) California: Riverside Co.; N. end of Coxcomb Mts., on flats ca. 2 miles N. of base of mountains, March 26, 1969; mature larva feeding on flowers of *Lepidium fremontii* Wats., *J. F. Emmel 148* (CAS); (Cruciferae). Reared to adult; male emerged April 7, 1969.
(B) Utah: Duchesne Co.; 23 road miles SW of Duchesne on Utah State Hwy. 33, Indian Canyon, along roadside, August 17, 1969; female oviposited at 9:10 a.m. MST on leaf underside of *Malcomia africana* (L.) R. Br., *J. F. Emmel 218* (CAS); (Cruciferae). This female is somewhat intermediate between *P. protodice* and *P. occidentalis* Reakirt, and may represent the latter species.
4. *Pieris occidentalis* Reakirt. Nevada: Humboldt Co.; Martin Creek Ranger Station, 7000', Santa Rosa Range, in canyon bottom near stream, July 20, 1969; female oviposited at 10:25 a.m. PST on flower bud of *Thlaspi arvense* L., *J. F. Emmel 192* (CAS); (Cruciferae).
5. *Pieris napi oleracea* Harris. California: Mariposa Co.; small ravine N. of road, ca. 0.4 road mile W. of Yosemite National Park boundary on Hwy. 140, near El Portal, 2050-2250', April 12, 1970, leg. JFE only; ovum on leaf underside of *Arabis glabra* (L.) Bernh., *J. F. Emmel 258* (CAS); (Cruciferae). Reared to adult; male emerged May 8, 1970.
6. *Pieris rapae* (Linnaeus). Utah: Uintah Co.; Merkley Park, N. of Vernal, along roadside, August 20, 1969; female oviposited at 11:00 a.m. MST on leaf underside of *Cleome serrulata* Pursh, *J. F. Emmel 221* (CAS); (Capparidaceae). Numerous other *P. rapae* adults were noted in close association with this plant at this locality.
7. *Colias meadii* Edwards. (A) Wyoming: Albany Co.; Lewis Lake Campground, 11,000', Medicine Bow Mts., in dry meadow, August 22, 1968; female oviposited at 10:10 a.m. MST on leaf underside of *Trifolium parryi* Gray, *J. F. Emmel 121* (CAS); (Leguminosae). A second *C. meadii* female was observed to oviposit on this same *Trifolium* species at 10:30 a.m. MST in the same locality.
(B) Same locality and date as for 7A above; at 11,100', on well-drained rocky benches; female oviposited at 10:20 a.m. MST on leaf upperside of *Trifolium dasyphyllum* T. & G., *J. F. Emmel 122* (CAS); (Leguminosae).

- (C) Colorado: Dolores Co.; 1 mile SW of Lizard Head Pass, 10,000', on open dry ground, August 31, 1968; female oviposited at 12:15 p.m. MST on leaf of *Astragalus alpinus* L., J. F. Emmel 134 (CAS); (Leguminosae).
8. *Colias eurytheme* Boisduval. California: Modoc Co.; 1 road mile E. of town of Pine Creek, E. of Hwy. 395, Warner Mts., in dry meadow near stream, July 15, 1968; albinic female oviposited on leaf of *Vicia americana* Muhl., J. F. Emmel 80 (CAS); (Leguminosae).
9. *Colias philodice* Godart. Colorado: Montezuma Co.; Morefield Canyon, 7800', Mesa Verde National Park, in dry meadow September 1, 1968; female oviposited at 1:00 p.m. MST on leaf underside of *Hedysarum boreale* Nutt., J. F. Emmel 137 (CAS); (Leguminosae).
10. *Anthocharis sara thoosa* Scudder. California: San Bernardino Co.; canyon above Bonanza King Mine, 4500', E. side of Providence Mts., on rocky slope above wash, March 28, 1969; two ova on flower buds of *Arabis perennans* Wats., J. F. Emmel 152 (CAS); (Cruciferae). Both were reared to pupae; pupal morphology was indistinguishable from that of pupae of other *A. sara* populations reared by the authors. One pupa died several days after pupation. An adult male formed in the other pupa, but failed to emerge; this was dissected from the pupal shell on January 18, 1970. The wing pattern closely resembled that of *A. sara thoosa* adults from the Providence Mts.

NYMPHALIDAE

1. *Limenitis weidemeyerii nevadae* Barnes & Benjamin. Nevada: Clark Co.; Sawmill Canyon, 6700', 4 air miles NW of Mormon Well, E. side Sheep Range, in dry wash of canyon bottom, July 2, 1969; female oviposited at 7:45 a.m. PST on leaf tip of *Amelanchier utahensis* Koehne, J. F. Emmel 177 (CAS); (Rosaceae).
2. *Limenitis weidemeyerii latifascia* Perkins & Perkins. (A) Nevada: Nye Co.; Jett Canyon, 6500', Toiyabe Range, on rocky slope near canyon bottom, July 10, 1969; female oviposited at 12:10 p.m. PST on leaf tip of *Holodiscus boursieri* (Carr.) Rehd., J. F. Emmel 185 (CAS); (Rosaceae).

(B) Nevada: Nye Co.; Jett Canyon, 6800', Toiyabe Range, along stream, July 10, 1969; female oviposited at 12:30 p.m. PST on leaf tip of *Salix exigua* Nutt., *J. F. Emmel 186* (CAS); (Salicaceae). Female was not captured, but field identification was positive.

(C) California: Mono Co.; Cottonwood Canyon, 7300', S. of Bodie, on rocky canyon slope, July 14, 1969; female oviposited at 11:20 a.m. PST on leaf tip of *Holodiscus microphyllus* Rydb., *J. F. Emmel 188* (CAS); (Rosaceae).

(D) Nevada: White Pine Co.; Kalamazoo Creek, 7000', E. side of Schell Creek Range, along stream, July 31, 1969; female oviposited at 11:15 a.m. PST on leaf tip of *Populus angustifolia* James, *J. F. Emmel 204* (CAS); (Salicaceae).

3. *Limenitis lorquini* Boisduval. California: San Bernardino Co.; Little Cienega Seca, Highway 38, San Bernardino Mts., near edge of pond, June 27, 1969; female oviposited at 2:00 p.m. PST on leaf tip of *Salix lutea* Nutt., *J. F. Emmel 173* (CAS); (Salicaceae).
4. *Polygonia oreas oreas* (Edwards). California: Marin Co.; 0.4 road mile S. of Devil's Gulch Group Camp turnoff, along Lagunitas Creek, Samuel P. Taylor State Park, April 30, 1969; 3rd instar larva feeding on leaves of *Ribes divaricatum* Dougl., *J. F. Emmel 153* (CAS); (Saxifragaceae). Reared to adult; male emerged May 21, 1969.
5. *Chlosyne palla* (Boisduval). California: Stanislaus Co.; Del Puerto Canyon, 22 road miles W. of Patterson, on dry bank near stream, May 4, 1968; mature larva feeding on leaves of *Solidago californica* Nutt., *J. F. Emmel 143* (CAS); (Compositae). Reared to adult, female emerged May 25, 1968. Plant was not in flower on date larva was collected, so it was marked and collected on September 13, 1968, when in full bloom.
6. *Polydryas pola* (Boisduval). Colorado: Boulder Co.; west end of Bighorn Mountain, 8400', E. of Gold Hill, in dry meadow, August 24, 1968; female oviposited at 11:30 a.m. MST (27 ova laid in 3 rows on leaf underside) on seedling of *Penstemon barbatus* ssp. *torreyi* (Benth.) Keck, *J. F. Emmel 124* (CAS); (Scrophulariaceae). Leaf and stem morphology were compared with nearby flowering plants of the same species.

7. *Euphydryas chalcedona chalcedona* (Doubleday). California: San Mateo Co.; crest of San Bruno Mts., 2 air miles W. of Sierra Point, 1000', on open gravelly soil, March 21, 1969; mature larva feeding on leaves of *Plantago erecta* Morris, J. F. Emmel 147 (CAS); (Plantaginaceae). Reared to adult; male emerged April 5, 1969.
8. *Speyeria nokomis nokomis* (Edwards). Utah: Duchesne Co.; 5½ road miles N. of Mountain Home, at turnoff to Yellowstone Creek, along Lake Fork Creek, in wet meadow, August 17, 1969; female oviposited at 1:40 p.m. MST on underside of dry twig 2 inches off ground and 6 inches from *Viola nephrophylla* Greene, J. F. Emmel 219 (CAS); (Violaceae). No other *Viola* species were found in this meadow.
9. *Speyeria atlantis irene* (Boisduval). California: Siskiyou Co.; Brown's Meadow, on trail from Big Flat to Caribou Lake, Trinity Alps, in open dry meadow, July 23, 1968; female oviposited in ground litter near *Viola purpurea* Kell., J. F. Emmel 95 (CAS); (Violaceae).
10. *Speyeria mormonia eurynome* (Edwards). Colorado: Routt Co.; Meadows Campground, 9600', W. side of Rabbit Ears Pass, in grassy area near stream, August 27, 1968; female oviposited 2 ova in ground litter 2 inches from *Viola adunca* var. *bellidifolia* (Greene) Harrington, J. F. Emmel 130 (CAS); (Violaceae). No other *Viola* species were noted in the immediate vicinity.
11. *Euptoieta claudia* (Cramer). Utah: Kane Co.; Stout Canyon, 6300', 6 road miles N. of Glendale, on gravelly soil at lower edge of yellow pine zone, September 5, 1968; two 4th instar larvae feeding on flowers, fruits, and leaves of *Linum rigidum* Pursh, J. F. Emmel 141 (CAS); (Linaceae). Both reared to adults; female emerged October 1, 1968; male emerged October 3, 1968.

LYCAENIDAE

1. *Apodemia mormo mormo* (Felder & Felder). (A) Nevada: Nye Co.; Ralston Valley, 5600', 1½ road miles W. of jct. State Hwy. 8A and U.S. Hwy. 6, E. of Tonopah, T. 3 N., R. 43 E., in sandy area along highway, August 2, 1969; mature larva resting on stem of *Eriogonum kearneyi* Tidestr. var. *kearneyi*, A. O. Shields 4 (NA); (Polygonaceae).

- (B) California: San Bernardino Co.; 14 road miles from U.S. Hwy. 66 on Kelbaker Road, S. 21, T. 8 N., R. 13 E., S. of Granite Mts. (N. of Amboy), in large sandy wash, September 11, 1969; mature larva feeding on flowers of *Eriogonum plumatella* Dur. & Hilg. var. *plumatella*, A. O. Shields 62 (NA); (Polygonaceae).
2. *Callipsyche behrii* (Edwards). Nevada: Lincoln Co.; Oak Springs Summit, 6200', ca. 10 road miles W. of Caliente, on gentle slope among pinyons, July 3, 1969; female oviposited at 7:50 a.m. PST on stem of *Purshia tridentata* (Pursh) DC., J. F. Emmel 178 (CAS); (Rosaceae).
 3. *Strymon melinus* Hübner. California: San Diego Co.; Solana Beach, on dunes above beach, September 18, 1968; female oviposited at 11:40 a.m. PST on flower head of *Eriogonum parvifolium* Sm. in Rees var. *parvifolium*, J. F. Emmel 145 (NA); (Polygonaceae). Several mature larvae found in flowerheads of nearby plants of this species; one reared to adult; female emerged October 12, 1968.
 4. *Lycaena arota virginiensis* (Edwards). Nevada: Lander Co.; Kingston Canyon, 6600', Toiyabe Range, on rocky talus slope above canyon bottom, June 13, 1969; several mature larvae feeding on leaves of *Ribes velutinum* Greene, J. F. Emmel 158 (CAS); (Saxifragaceae). One reared to adult; male emerged July 5, 1969.
 5. *Lycaena heteronea coloradensis* (Gunder). Wyoming: Carbon Co.; NE of Battle Lake, 9000', Sierra Madre Mts., August 21, 1968; female oviposited at 12:30 p.m. MST on leaf underside of *Eriogonum subalpinum* Greene, J. F. Emmel 120 (CAS); (Polygonaceae).
 6. *Brephidium exilis* (Boisduval). Utah: Washington Co.; Watchman Campground, W. end of Zion National Park, on disturbed soil in open, August 30, 1969; 3 mature larvae feeding on flowers of *Salsola pestifer* A. Nels., J. F. Emmel 224 (CAS); (Chenopodiaceae). One reared to adult; male emerged September 11, 1969.
 7. *Plebejus saepiolus hilda* (Grinnell & Grinnell). California: San Bernardino Co.; Little Cienega Seca, Hwy. 38, San Bernardino Mts., in grassy meadow near small pond, June 27, 1969; female oviposited at 1:45 p.m. PST on flowerhead of *Trifolium wormskioldii* Lehm., J. F. Emmel 172 (CAS); (Leguminosae). A number of lycae-

nid ova, indistinguishable from the ovum laid by this female, were found in the flowerheads of nearby plants of this *Trifolium*.

8. *Agriades glandon rustica* (Edwards). (A) Wyoming: Carbon Co.; NE of Battle Lake, 9000', Sierra Madre Mts., open ground near hill summit, among sagebrush and lupines, August 20, 1968; female oviposited at 12:30 p.m. MST on leaf underside of *Androsace septentrionalis* var. *puberulenta* (Rybd.) Knuth., *J. F. Emmel 118* (CAS); (Primulaceae). About 5 additional lycaenid ova, indistinguishable from the ovum laid by this female, were found on nearby plants of this species. One was located on a leaf upperside, but the remainder were found on leaf undersides.

(B) Colorado: Clear Creek Co.; above Guanella Pass, 11,700-11,800', 11 road miles S. of Georgetown, on open gravelly slope, August 25, 1968; 17 ova found on leaves near plant bases of *Androsace septentrionalis* var. *subumbellata* A. Nels., *J. F. Emmel 126* (CAS); (Primulaceae). These ova were compared with ova dissected from an *A. glandon* female taken in the same locality, and found to be indistinguishable. Several *A. glandon* females in this locality showed pre-oviposition behavior toward this plant.

9. *Glaucopsyche lygdamus oro* Scudder. Colorado: Gunnison Co.; hills 1½ air miles SE of Gothic, 9400', open grassy meadow, July 4, 1967; female oviposited at 11:00 a.m. MST on flower bud of *Vicia americana* Muhl. ex Willd., *J. F. Emmel 4* (DS); (Leguminosae).
10. *Glaucopsyche lygdamus* near *australis* Grinnell. California: Monterey Co.; sand dunes W. of intersection of Palm Ave. and Lake Dr., W. of Marina, 60-100', March 21, 1970; female oviposited at 11:25 a.m. PST at base of flower bud of *Lotus scoparius* (Nutt.) Ottley, *J. F. Emmel 230* (CAS); (Leguminosae).

HESPERIIDAE

1. *Hesperia nevada* (Scudder). California: Alpine Co.; Ebbetts Pass, 8730', open gravelly hilltop, August 7, 1969; female oviposited at 11:30 a.m. PST on leaf upperside of *Sitanion hystrix* (Nutt.) J. G. Sm., *J. F. Emmel 212* (CAS); (Gramineae).

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